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Anatomy of life and well-being: A framework for the contributions of phenomenology and complexity theory

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Abstract
This paper proposes an anatomy of the phenomena of life and of correlate qualitative modes of empirical research, theory, and professional practice concerned with health and well-being. I explicate the qualitative dynamic operative at every level of order, from the biological realm of cells and organisms, through distinctively human lifeworld experiences and practices, to communities of organisms in ecosystems and bio-cultural regions. This paper clarifies the unity of the dimensions of life and aligns these with demonstrated and emerging contributions of hermeneutical phenomenology and current complexity–autopoietic theory (including disciplinary and professional interpretations of empirical findings). The intent is begin to delineate a common framework upon which we could build—facilitating better understanding of the distinctive contributions of each specialization as well as the integration of diverse qualitative approaches with each other (and with quantitative complements).

Key words: *Phenomenology, complexity, organism, person, environment, health*

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Though phenomenology and empirical science are in a period of rich exchange, there are unnecessarily missed opportunities to deepen our understanding of qualitative approaches and to enact more robust research and praxis concerning health and well-being. This essay will contribute to overcoming the fracture of specializations and avoidable misunderstandings by making explicit the unity that runs through the "arc of life" and by showing how phenomenology and complexity theory are complementary in the way they operate across the entire range of integrated phenomena (Varela & Bouegie, 1992). These congruent interpretations robustly describe the critical qualitative dimensions of the anatomy of life and how to better approach well-being through research and diagnostic, therapeutic, and preventive practices. By elaborating the framework I intend to demonstrate the possibilities for further specialized yet integrated work by readers of this journal.

Part I: The human lifeworld and modes of interpretation

Methods

I employ a hermeneutic method to integrate the major contributions made by phenomenology and the empirical sciences broadly identifiable as complexity theory, showing how their qualitatively oriented approaches are complementary and together constitute a continuum. Specifically, I explicate interpretations of (a) the structures of bio-cultural phenomena and the constitution of concepts such as "organism," "person," "health," "disease," "well-being," and "environment" and (b) self-organizing space–time patterns of organism–environment relationships within which our human mode of embodiment emerges. I do this for phenomenology (Husserl, 1989; Heidegger, 1995), philosophical anthropology (Goldstein, 2000; Uexküll, 1926), and philosophy of medicine (Engelhardt, 2006; Zaner, 2004). I analyze

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the same subject matter for dissipative thermodynamics and open, non-linear processes (Prigogine, 1980), autopoietic systems (Maturana & Varela, 1998), developmental systems theory (DST) (Oyama, 2000), dialectical biology (Lewontin & Levins, 2007), and neurophenomenology enaction (Varela, Thompson, & Rosch, 1991).

We can better appreciate the contributions made by both qualitative and quantitative research, and theory insofar as we develop a unified understanding of what might be called the "arc of life"—that ranges from the energy flows of physical–chemical processes to cells, organs, whole organisms in Umwelts, other-than-human and human communities, ecosystems, and bio-cultural regions—and the place of persons within it. The figure of the "arc of life" delineates a framework for understanding these self-organizing, open, far-from-equilibrium phenomena and thus a non-arbitrary opening for further interpretation of empirical investigations and new (re)interpretations of previous findings (Juarrero, 2002). This anatomy provides a more adequate basis than hitherto for decision-making and pragmatic action in regard to critical issues: Is health to be considered in terms of each individual, or each species, or each ecological network? What actions would be adequate in regard to animal, human, and ecosystem well-being?

Accordingly, this essay moves hermeneutically, beginning with the human because it is the directly given phenomenal realm and then recovering the contexts upon which it depends and the conditions within which it thrives. I present something of a phenomenology of human life at the beginning and then continue to unpack its multiple horizons so that we can appreciate simultaneously the emergence of distinctive levels of life's ordering processes, the operative hierarchical governance and principles of intelligibility, and the complex factors bearing on health and well-being. Figure 1 depicts the basic anatomy of the dimensions of life.

Specific lifeworlds, especially the distinctively human mode of embodiment and existence

Along the continuous arc of life, where flows of energy and ordering processes operate uninterruptedly from the molecular to planetary, it is useful to think of multiple domains, one running from the molecular level to organisms, another from organisms to communities of organisms and ecosystems, including their co-constituted macro-environments. A third dimension is found in the distinctive lifeworlds of given organisms (Merleau-Ponty, 2003; Uexküll, 1926) that occur at mid-level where we recognize coherent patterns of placement and life activity that qualitatively differ from one kind of being to another (Merleau-Ponty, 1963; Varela et al., 1991).

Macro/Cosmic
Atmosphere, hydrosphere, lithosphere
biosphere
↕
Ecosystems of communities
↕
Communities in bio-cultural environments
↕
Organisms↔↔ distinctive lifeworlds
↕ including humans
Membranes/cells
↕
Bio-chemical/molecular (genetic)
physical–chemical
Micro/Sub-atomic

Of course, issues of health and well-being are not limited to humans: other-than-human organisms and ecosystems have their own parameters in regard to these values and humans can attain well-being only in relation to the micro-organisms and macro-environments that provide the parameters of our lifeworlds—to which we will return in Part II. But, given the value historically placed on persons, it is appropriate to begin with human health and well-being (Thomasma, Weisstub, & Hervé, 2001) using non-arbitrary categories and a set of hierarchical "levels of order of processes" or emergent phases.

Distinctively human lifeworld:

(d) Political–ethical community life.
(c) Unique individuality of each person.
(b) Intentional movement and action.
(a) Human sub-personal physiological–neurological –psychological life.

Human sub-personal physiological–neurological–psychological life

Our sub-personal functions have many commonalities with other organisms, yet also distinctive patterns, capacities, and limitations correlate with our particular mode of being embodied in the world. Here naturalized phenomenology has made empirical and theoretical advances in exploring cognition, perception, emotion, and the nervous and immune systems in a way that substantially challenges the dominant sciences—continuing the trajectory of the phenomenology of Husserl and Merleau-Ponty and the pioneering work of philosophical anthropology (Goldstein, 2000; Straus, 1963), which began a tradition of caring practices still influential in nursing, social work, clinical psychology, psychiatry, and treatment of traumatized and brain-damaged patients.

This sphere usually goes unnoticed as we unself-consciously participate in our lifeworld. We only attend to it when a "breakdown" occurs during

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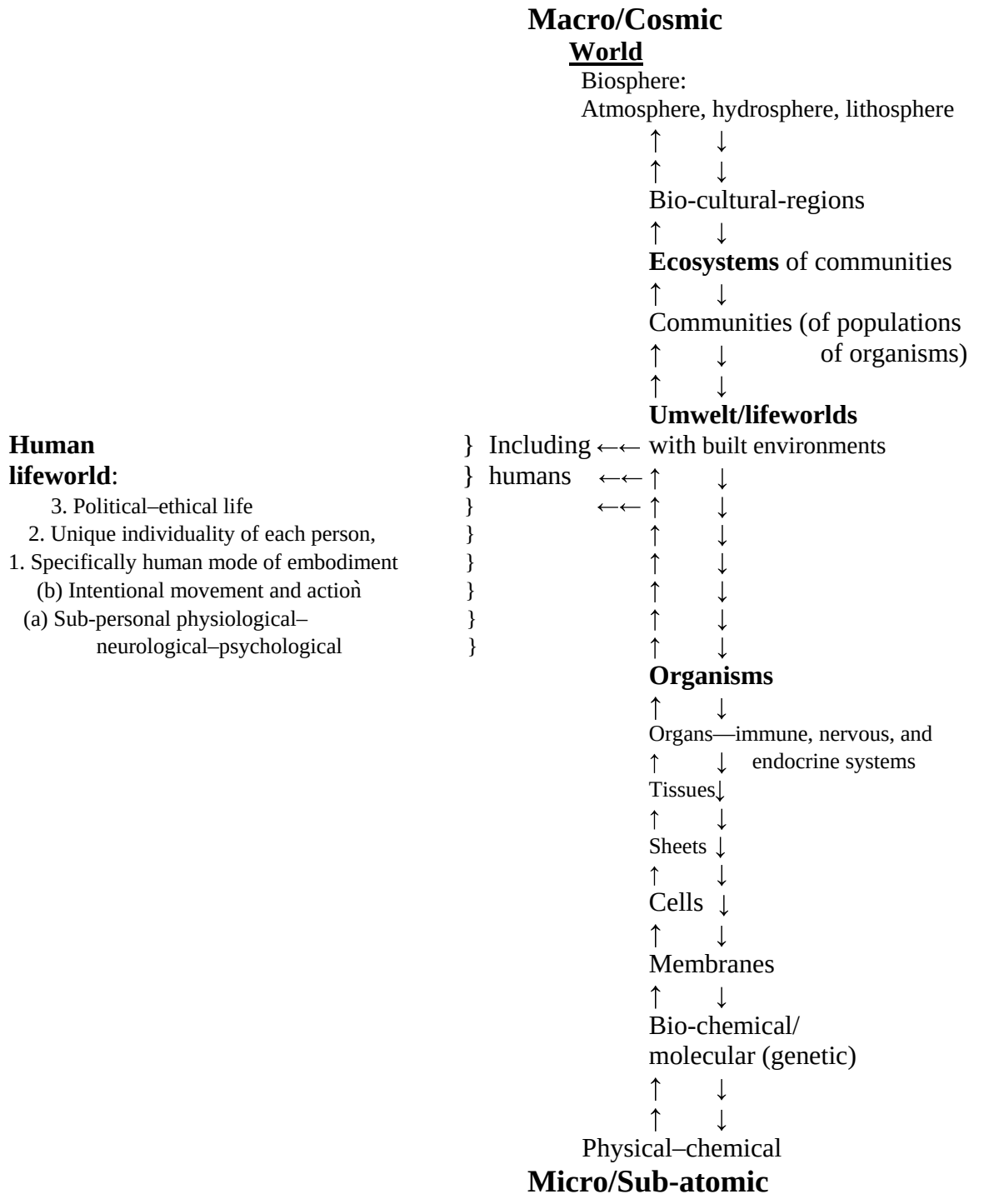

Figure 1. Arc of life: anatomy of life and environmental interpretation.

the course of daily routines, a recognition that is implicitly held in the key word: disease. Discontinuity in the ordinary flow of our well-being (as distinct from a surprising injury) is marked by a feeling, literally, of disease, in which there occurs "a disorganization of a patient's whole world" (Pellegrino, 1979, p. 64).

The sub-personal world is emergent, constituted as our internal autopoietic organization maintains its own endogenous activity and as we interact with the environment through complex and delicate patterns of sensorimotor activity. Since our human possibilities emerge from our mode of situated, embodied consciousness our particular kind of placement is

critical. Given that we are situated in the world as directional beings, with a strong vertical and horizontal orientation, with an upright posture, binocular vision, and distinctive hands that grasp and turn things (Maturana & Varela, 1998; Straus 1963), our health and well-being are intimately bound up with our lived body "as a centered unity," such that a major symptom of illness is feeling "disoriented" (Pellegrino & Thomasma, 1988).

Much therapeutic action depends on identifying and treating the bio-chemical and physiological systems at play in our sensorimotor, perceptual, and cognitive lives where sub-personal well-functioning and social conditions interact (Aho & Aho, 2008). Sub-personal phenomena such as breathing, temperature-regulation, saccadic eye movements as we scan our environment, and feelings are illuminated by phenomenologically oriented research on embodied cognition (Thompson, 2007). For example, the immune system is paradigmatic for other sub-personal phenomena since it plays a critical role in our ability to "ensure homeostasis of our internal molecular environment, a coherence of all organic systems," and also involves fundamental conceptions of health and "self," relationships among parts and wholes, and organism–environment interactions (Coutinho & Kazatchkine, 1994, p. 5). The traditional clonal selection theory (CST) now is challenged by the autonomous network theory (ANT) developed by neuro-phenomenology (Varela & Coutinho, 1991) which contends "that immune disorders are a form of the failure of homeostasis" (Coutinho & Kazatchkine, 1994). Though new therapies are not fully developed, treatments being explored seek ways for the whole immune system, integrated into a network with the nervous and endocrine systems, to autopoietically maintain its own organization and endogenous activity despite perturbances (Tauber, 1994, pp. 173–174).

Intentional movement and action

Normally we measure our health and well-being directly in terms of intentional action: our capacities to move ourselves or alter our world with a measure of control. The ability to oppose gravity by "getting up" every day, by ourselves, provides each of us a measure of our health and well-being throughout the course of our lives as we choose how to comport ourselves (Straus, 1969, pp. 34–42). It is not surprising that the focus of most research and clinical practices has been on self-regulation, ranging from bio-chemical cures and therapies for ulcers, broken bones, emotional distress, and other incapacitating conditions (Kahneman, Diener, & Schwarz, 1999). Again, the normal state of spontaneous engagement with projects in the world provides
the baseline from which Gadamer (1996, pp. 43, 112–115) can define health in terms of "the general equilibrium of the life in which [we are normally] active and able to be" ourselves, "involved in the world and being together with one's fellow human beings, in active and rewarding engagement in one's everyday tasks."

Because of the extent to which our lives are a matter of self-aware, deliberate attempts to accomplish what we project as goals (Gallagher & Zahavi, 2008) there is increasing (re)appreciation of the fundamental role played by practical knowledge. "Absorbed skillful" activity is developed into masterful performance as the result of learning acquired through experience and reflective practice (Flyvjberg, 2001)—a crucial point in political decision-making and the caring professions (Benner, Tanner, & Chelsa, 1996). In turn, our practices enact communal beliefs and values. The core reason for this essay's topic and this journal derives from the fact that we qualitatively respond to issues of health and well-being because of our understanding of humans as unique persons and because we do care for each other.

The unique individuality of each person

The emergence of humans as individually unique, though culturally and historically variable, is one of the most powerful drivers in the westernized world. How we act in regard to human health and well-being is linked with the way the individuality of each person is (or is not) recognized when disease is perceived as an interruption of identity—"I just don't feel like myself, doctor" (Caplan, Engelhardt, & McCartney, 1981, p. 505). Congruently, many argue that the accomplishments of the last 40 years in turning attention to the patient as person need to be affirmed, even expanded, in the face of post-humanist movements (Benner et al., 1996; Thomasma et al., 2001).

In the broader scientific-cultural context, focus on the person resists reductivisms at both micro- and macro-scales. The current "gene-centric" emphasis on the molecular atomizes the body, replacing it with infomatic-codes (Lewontin, 1991); at the opposite extreme, individuals (and societies of individuals) are statistically dissolved into populations (a point of contention between public health and primary care approaches). Unavoidably, these alternative scientific views carry ethical implications as to who—or

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what—we are treating, what we may or may not do, when pursuing health and well-being.

Recent research is congruent with the traditional medical charge: relieving the suffering of the patient at hand; even a goal of restoring or maintaining a patient's normal condition refers to their particularity, not to a general category. Canguilhem (2008, p. 132) questions the usual definition of "the pathological," arguing that rigorously speaking, "'pathological' is the vital contrary of 'healthy' and not the logical contrary of 'normal' // [for example] as we move "across the many intermediaries from morphological anomaly to functional disease":

> We cannot determine the normal by simple reference to a statistical mean but only by comparing the individual to itself, either in identical successive situations or in varied situations. // A norm // must help us understand concrete individual cases // [where an alteration in] the total comportment of an organism // does not appear to be a disease until the moment when the being's existence, hitherto in equilibrium with its milieu, becomes dangerously troubled. (Goldstein, 2000, pp. 128–129, 131)

One of the major ways to articulate and comprehend the individuality of a person is through medical narratives (Kleinman, 1988; Zaner, 2004). This is especially important insofar as the success of scientific knowledge and rationalized technology "actually increases the qualitative" distance from "the correct decisions of the moment" (Gadamer, 1996, p. 21; Mol, 2008). In order to

> help a patient grapple with the loss of health and find meaning in illness and dying // along with their growing scientific expertise, doctors, [nurses, and social workers] need the expertise to listen to their patients, to understand as best they can the ordeals of illness. (Charon, 2006, p. 3)

Further, recognizing that discernments and diagnoses of health and illness are made within historical communities (Caplan et al., 1991) raises the question of differences and similarities across cultures, a project requiring sophisticated cross-cultural anthropological and historical studies (such as Bergdolt, 2008; Engelhardt, 2006; Tao Lai Po-wah, 2006).

Political and ethical life

In terms of the stable organization and changing structural characteristics of autopoietic systems, humans emerge as self-conscious and enactively bring forth a world through structural couplings that are always already social–linguistic. Within the complex systems of coupling and feedback that constitute the unity of each particular human society differences in historical, biological, and cultural perceptions and valuations underlie differences in the ways we care for or exploit environments and each other (Maturana & Varela, 1998, p. 232). The variety of viable human lifeworlds is not accidentally related to our flexibility and resilience since the possibilities generated by our symbolic transformations eventually play out as the openness critical for our well-being (Heidegger, 1995; Plessner, 1980).

> Especially in humans, health is precisely a certain latitude, a certain play in the norms of life and behavior. What characterizes health is a capacity to tolerate variations in norms on which only the stability of situations and milieus // confers a deceptive value of definite normalcy. Humans are truly healthy only when capable of several norms, when they are more than normal. The measure of health is a certain capacity to overcome organic crises and to establish a new physiological order, different from the old. (Canguilhem, 2008, p. 132)

In terms of health and well-being, differences in access to resources also appear, so that conflicts and practices of "unequal" allocation are matters of justice. Granting the fundamental importance of the biological base of health and well-being, many contend that the greatest problems concerning quality of health actually are social: the reason why so many people remain subject to disease, suffering, and early death when we have the knowledge and technical means to intervene finally would lie in our economic and political structures (Lewontin, 1991, pp. 44–45). Nor would environmental well-being—ecological sustainability—occur unless we deal with the role that poverty plays (Millennium Ecosystem Assessment, 2003).

What would provide a morally and politically adequate basis for decisions and actions? Just as the universalizing abstractions of quantitative science, in principle and fact, falter before the uniqueness of persons in regard to particular historical lifeworlds a contextual epistemology is both theoretically superior and operationalizable. This is especially true for the healing professions, law, and the ethical–political realms because of the understanding that is gained through practice, clients' biographies, and the diversity of valid local knowledge

arising from experiences in specific environments (Flyvjberg, 2001; Longino, 1990, p. 195).

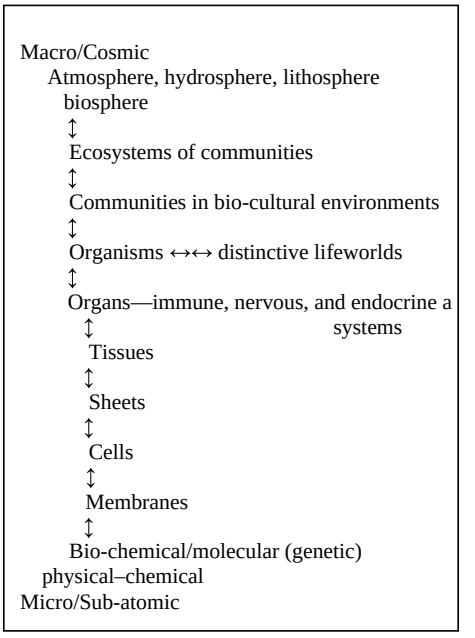
Where well-being is understood as a matter of the individual person within communally enacted bio-cultural realms the idea of health as the capacity to engage uninterruptedly in one's lifeworld connects to the hitherto mainly ecological concept of resilience (Mugerauer, 2010a). Thus, issues of human health and well-being open to questions concerning the relation of human lifeworlds and those of other organisms.

PART II: The arc of life as the horizon of health and well-being

Since the specifically human takes place within and as unseparated from the comprehensive arc of life the next step is to consider the horizons within which human communities emerged and are maintained: physico-chemical and then biological bases on the one side, and ecosystems and a supporting biosphere on the other side—keeping in mind that there are Umwelts for millions of other organisms, all of which also are within these physical systems and webs of ecosystems.

Bio-chemical (molecular) to organisms

Membrane and cell. The emergence of the cell—the fundamental unit of life—from the physical–chemical opens the question of health and well-being for the first time because with the cell we have the phenomena of an entity that lives and dies, as distinct from what merely endures or disappears. Though the part is only intelligible within the whole web of life and the biosphere, it is not surprising that disagreements about what life is and what the focus of our research and therapies should be center on questions concerning the character of the micro-molecular level and its relation to the living beings of which the micro is "a part." This is especially the case since the dominant view of science (as well as its funding, research projects, and therapeutic or commercial applications) has shifted from biology and zoology to micro-studies as a result of the breakthroughs in operationalizing models of molecular combination in DNA and RNA. That a cell (or multi-celled being) depends on continuation of its physio-chemical processes is not in question. Rather, the issue is whether or not health and well-being primarily and finally are a matter of the continuation of the molecular processes alone or of the cellular (multi-cellular organism) as a whole. For example, the ideas of the selfish gene and the organism as the mere vehicle for molecular continuity provide a radically different measure than does the organism itself.



Molecules and membranes together operate at the beginning of life: molecules combine and are "held" together inside a membrane, even as some are transported across it, to form cells. The emergence of the cell as the primal life-form depends upon the membrane, which allows for the emergence of something with identity, i.e., both distinguished from the flux and participating in processes of exchange with the external elements that are vital to life (Yeagle, 1992). Here, for the first time, an individual life occurs, persisting for a while to the extent that it thrives or fails (Morowitz, 1992).

Though membranes are substantial enough to delimit an inside from an outside they do not seal the cell off from its surroundings (Fleischaker, Colonna, & Luisi, 1994). On the contrary, the membranes are porous, allowing the transactions across the membrane to and from its environment that are critical to its remaining alive (Cavalier-Smith, 2004). They also are plastic: physically flexible and changeable in form during their own development and allowing for multiplication or reproduction. These features of the structure of the cellular membrane and thus of the cell—porous boundaries and a plasticity that delineate identity while, respectively, enabling coupling, and transformations—characterize all life and set measures for well-being.

While the formation of (cellular) membranes is intelligible in terms of the processes of lipids and hydrophilic/hydrophobic molecules, mystery still surrounds the transformation to the living cell (Yeagle, 1992). If we do not pause at this enigma, beyond the relation of a given cell to its physico-chemical basis and environment it interrelates with surrounding populations of other similar or different

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cells, and to super-sized multi-celled beings (Cavalier-Smith, 2004). Here the health and well-being of many life-forms are entangled with each other, so that understanding and action require qualitative discernments of identity, difference, and relation. The story of the development from unicellular to multicellular organisms, while still speculative, nonetheless can be puzzled out: the increasingly accepted account holds that eukaryotes emerged by way of symbiosis and symbiogenesis of prokaryotes (Hirt & Horner, 2004, pp. 2–4), where some were only partially ingested by those feeding on them, resulting in a fusion of one within the other, such that the hybrid became eukaryotic—a completely unpredictable branching off that led to fungi, animals, plants (Margulis & Sagan, 1995). Since composite life-forms already emerge at the basic cellular level clearly the well-being of a given "living thing" depends on the thriving of interactive "components," some of which are permanently fused while others remain distinct.

Organisms and surroundings (Umwelt). As life unfolds from singular cells to sheets of cells to tissues, as organs and complex immune and nervous systems evolve, organisms emerge. The intricacy of each "element," of relations among elements internal to the organism, and of the connections of these with the environment constitute the bulk of life science research and medical practices, and generate one of our most troubled questions: What are the most revealing definitions and the most illuminating ways to understand "organisms"? There is an ambiguity in the term "organism" because its meaning—"a unified, autopoietic form of life"—denotes both the cell and the complex of cells we recognize as a plant or animal. Maturana and Varela distinguish the two modes as first- and second-order autopoietic structures (I use "cell" to refer to first-order structures and "whole organism or just "organism" to refer to the second-order). The argument is that a shift occurs with the emergence of "the total organism as a mobile unit in space," for "the passage to cognition occurs at the level of a behavioral entity, and not, as in the basic cellular self, as a spatially bounded entity," where the organism "by the very same process of constituting itself, configures an external world of perception and action" (Varela & Bouegie, 1992, p. xiii).

It is precisely with the phenomena of the organism that we can fully appreciate the inadequacy of the gene-centric view in debating whether the organism should continue to be set aside in favor of the molecular—i.e., as we pose the critical question "the health of what?" (Harold, 2001). The usual reductive view of genes as the basic and only "atoms" of life, which replicate themselves and build up into organisms fails: "Between the information coded into genes and the adaptive traits of a plant or animal (i.e., between genotype and phenotype), there are several layers of self-organizing processes, each sustained by endogenously generated stable states, themselves a matter-energy flow" (DeLanda, 1997, p. 112; Kauffman, 1993, p. 525). Genes do not reproduce themselves; DNA does not self-replicate, much less determine the final outcome we call a living being since "genomes are entire genetic systems, active only when they reside inside cells": "membranes and cell skeletons interact with each other and with genes, catalysts, small molecules, ions, and water to make cells that can grow and divide; // genes do not make organisms" (Cavalier-Smith, 2004, p. 336; Margulis & Sagan, 2002, p. 37). Indeed the "turning off and on of the production of the body's constituents (such as proteins) is itself sensitive to external conditions" and "organisms actually change the basic physical nature of signals that come to them from the external world," for example, as changes in temperature are converted within the body to changes in the concentration of blood sugar and of some hormones that are detectable by the liver (Lewontin, 1991, pp. 47–48, 116).

Insofar as zoology and biology yield to the molecular and genetic by assuming that there is nothing important beyond the molecular materials and processes we abandon the cell and organism. But 90 years ago, Uexküll already pointed out that given the character of the nervous system the various stimuli causing excitement could not be qualitatively differentiated by the nervous system itself because within the system all such differences are removed. Rather a more complex integration of information and context needs to be provided—carried out—by the organism which is able to qualitatively differentiate and respond to what is in its surroundings (Uexküll, 1926, p. 147). "If anything in the world can be said to be self-replicating, it is not the gene, but the entire organism as a complex system"; the brain does not perceive, the animal does (Lewontin, 1991, p. 48).

Complex organisms, just as individual cells, display a plasticity that allows processes generating substantial polymorphism, the very flexibility of elements that opens the possibility of reproduction, development, and evolution. Individual elements are so plastic that from them alone one can neither predict what they will become, nor where: a given set of genetic materials may develop variously into eyes or

feet; tissues and organs respond to diffuse circulation, nervous, and immune systems. Pragmatically, understanding this range of flexibility and stability manifest in changes that happen during individual lifetimes or through evolution requires that we consider the whole organism in its environmental context.

Growth and developmental studies have assumed increased importance in accounting for how an organism "maintains a unity—at all times a unity of fullness, not from incomplete to complete"—while undergoing dynamic, discontinuous change (Varela, 1979, p. 67). Current research and reassessments in DST, constructivist interactionism, emergence, and co-evolution are elaborating an epigenetic position (in contest with the performatist view wherein development is understood to "be performed by genes") that clarifies the interactive dynamic among organisms and their environments (Oyama, Griffiths, & Gray, 2001, p. 4). Not only humans, but organisms at all scales modify and are modified by their environments in ways that are far more complex than are accounted for in dominant neo-Darwinian genetic-environment modeling (Mugerauer, 2010b).

Environment influences growth and development. For all the importance of genetics, environmental factors can radically modify organisms "in process" as it were (which means that organic forms are neither inherent-fixed nor biologically generated-determined). "In general, the morphology, physiology, metabolism, and behavior, i.e., the phenotype of an organism at any moment in its life is a product of both the genes transmitted from the parents and the environment in which development has occurred up until that moment" as is well documented by studies showing how environmental factors such as light, diet, temperature, humidity, and local chemicals can significantly modulate the character and possible activity of many organisms. Yet, natural environments are not given as fixed contexts within which organisms must reactively adapt to survive in a inexorably deterministic, competitive process, as is seen in the way organisms actively participate in and modify events by means of both niche selection and construction (Lewontin, 1991, p. 117).

In the first place, organisms select what counts as or amounts to a niche for that organism as was famously presented by Uexküll (1926, p. 126) with his conception of Umwelt (perhaps best translated as "surround world" or "effective surroundings,") and argued by Merleau-Ponty (1963, p. 13):

> It is the organism itself—according to the proper nature of its receptors, the thresholds of its nerve centers and the movements of its organs—which chooses the stimuli in the physical world to which it will be sensitive. "The environment (*Umwelt*) emerges from the world through the actualization or the being of the organism—[granted that] an organism can exist only if it succeeds in finding in the world an adequate environment."

Secondly, creatures ranging from flies and spiders to fish, birds, and mammals actively shape their environments, changing them in what is nothing less than niche construction (Turner, 2000; Von Frisch, 1974). Empirical and theoretical analyses of organism-engineered environments explicates a third point: a higher-order self-organizing system (beyond autopoietic cells and individual organisms) unfolds when the environments selected as relevant, produced, or modified influence the development of offspring, for example in the cases of oviparous insects or with the nurturing that occurs in nests and dens. Thus, niche construction provides "a bonafide inheritance system" that shapes future populations (Laland, Odling-Smee, & Feldman, 2001, pp. 118–120; Sterelny, 2001, p. 336).

Fourthly, organism-generated changes unavoidably impact other forms of life, as is the case with beavers' modifications of the structure and dynamics of riparian zones that can persist for centuries, influencing the composition and diversity of both plant and animal communities living within that world (Jones, Lawton, & Shachak, 1997; Laland et al., 2001, p. 119). A fifth dimension appears through the long-term changes occurring in future generations of all the affected organisms. To continue our example, the beavers' constructed dam and lodge, and the altered rivers that are the heritage of future generations of all organisms in the local environment creates a "cascade effect" setting "up a host of selection pressures that feed back to act on // genes that may influence // many other aspects of their phenotypes" (Laland et al., 2001, p. 119). Such behaviors finally influence the evolution of their own and other species. That is, empirical evidence and new interpretations of how populations and their environments are co-constructed and co-evolve move us toward an interactionist model of organisms ←→ environment (Mugerauer, 2010b).

Organisms to bio-cultural regions

Beyond the organism there still remain the larger domains of entire ecosystems, bio-cultural regions, and the biosphere. Whether, or to what extent, the status of individuality applies to other than recognizably whole organisms (in and as communities) is a matter of considerable debate because it is crucial for decisions concerning well-being where

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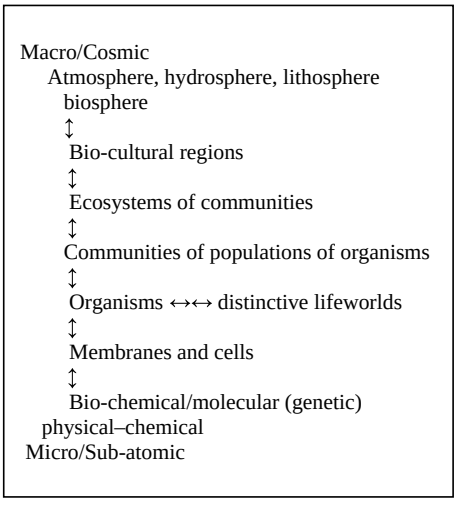
"individuality" provides the ontological locus of most of what we consider ethical–political rights and duties. The question of individuality in regard to "community," in its variations of aggregates, assemblages, composites, collectives, colonies, and confederacies is complicated, due in part to the phenomena themselves, in part to our (contested) conceptual categories and vocabulary.



What is it for which we would be responsible (Thomasma et al., 2001)? Given the primary point that the unity of biological diversity is blurred as each organism associates with others across dynamic boundaries, should we not operate from the new assumption that to understand the character of the living, the key is to "ask not what an individual is, but 'how' it is in relation to its connectedness" (Margulis & Sagan, 1995, p. 5)? Should we not act on the correlate new implication for health: if we are walking assemblages of cells, we imagine pathogen microbes attacking us; but if they are part of the collectives that form us "isn't health less a question of resistance to invasion from the outside and much more an issue of ecological relationships among committee members" (Magulis & Sagan, 2002, p. 19)? According to the unified systems approach "health and disease, rather than representing discrete 'states' or conditions as in traditional views, need to be seen as phases of the continuously changing multilevel set of processes (e.g., cellular, chemical, physiological, behavioral) that at any one moment constitute" an organism's life (Fabrega, 1981, p. 513).

As we have seen, combining the quantitative and qualitative by thinking in terms of self-organizing non-linear, dynamic, complex systems helps us to understand emergent phenomena often displaying both unexpected and not easily discernable patterns. In the biological sphere, such pattern formation appears in unicellular organisms, in multi-cellular aggregates, in physiology with its homeostasis (glucose concentrations, the human menstrual cycle), in "dynamical diseases (ovulatory disorders, sudden cardiac arrest)—where recognition of the dynamic character has changed the courses of treatment" (Camazine, Thies, Ristine, & Didion, 2001, pp. 95, 100–103; Solé & Goodwin, 2000, pp. 91–117).

Complexity theory further applies at increasingly larger scales and scopes where we encounter even more puzzling issues as the concept of "an individual organism" is inadequate to deal with the life-cycle and well-being of an entire colony, nest, or mott (often referred to as a "super-organism") over a long term (Keller & Ross, 1993, pp. 335–36; Strerelny, 2001, p. 334). At the next level, systems of systems develop as ecological networks (as communities of different kinds of organisms in their relationships to dimensions of shared environments). Though disagreements remain about whether ecosystems might be autopoietic in the strong sense applicable to cells and organisms, there is substantial agreement that ecosystems are dynamic complex adaptive systems of autopoietic and other elements (Millennial Ecosystem Assessment, 2003, pp. 49–51). Since ecosystems such as coral reefs and tropical rainforests "exhibit emergent properties, positive and negative feedback, generated and operative within physical and biological parameters" complexity sciences are important for understanding and managing their high diversity (increasingly threatened by habitat fragmentation and loss, especially within patch dynamics) (Solé & Goodwin, 2000, pp. 3, 29, 179, 191–192).

As we better appreciate the importance of ecological systems, we are led to the idea of health and well-being as sustainability or resilience (Gunderson & Pritchard, 2002). Emphasis on stability as the measure and thus goal of becoming or remaining healthy correlates with scientific and social ideas of preservation and conservation, and most of restoration. However, seeing natural systems as dynamically, constantly changing has led to complexity theory's concept of "resilience—the capacity of a system to absorb disturbance and still retain its basic formation and structure" or to shift to another possible stable state involving different behaviors and structure. This new focus on discontinuous and non-reversible processes across bifurcations recognizes and embraces rather than resists more substantial change in the form of possible entire regime shifts and explores how diversity promotes adaptive capacity for ecosystem well-being (Schneider & Sagan, 2005).

The local particularity and plurality of co-constituted lifeworlds and ecological systems needs

to be balanced by attending to their "changes linked to social and economic processes at regional to continental scales" (Gunderson & Pritchard, 2002, p. 64). Complementary with science's attempt to discern ecosystem boundaries in terms of "where a number of discontinuities coincide, for instance in the distribution of organisms, soil types, drainage basins, or depth in a water body" (Millennial Ecosystem Assessment, 2003, p. 51), indispensible cognitive contributions come from phenomenological descriptions of how:

> . . . the bio-cultural region provides the common context for everyday life. // These commonalities, rooted in the biology, geology, and climate of the area, have tended to unify the inhabitants and to differentiate them from the members of other regions. (Coates, 1981, p. 402)

Here we return to our ethical–political dilemmas, situated within the not yet explicitly debated valuations or implications of contending anthro-, bio-, and theo-centric world-views (Mugerauer & Manzo, 2008).

Micro- to macro-horizons and phenomenological-complexity interpretations

A final step remains, out to the micro- and macro-horizons of the material world—the planetary environments that both emerge from the lower-level orders of processes as well as operate in positive-feedback loops with the underlying physico-chemical properties in the global dynamic that obviously impacts the health and well-being of all people and other organisms.

Macro/Cosmic
Atmosphere, hydrosphere, lithosphere
biosphere
↕
Bio-cultural regions
↕
Ecosystems of communities
↕
Organisms↔ distinctive lifeworlds
↕
Membranes and cells
↕
Bio-chemical/molecular (genetic)
physical–chemical
Micro/Sub-atomic

In its largest extension complexity informs the whole of the earth and its life—the biosphere—and the macro-scale organism–environment co-constitutions (Schneider & Sagan, 2005, p. 144). The major paradigm shift in thermodynamics "has achieved a bridge between microscopic and macroscopic physics" (Prigogine, 1980, pp. 195–197): "fluctuations [that] are the macroscopic manifestations of fundamental properties of fluctuations arising on the microscopic level of unstable dynamical systems" occur in the flows of gasses and fluids that appear as weather and climate (Prigogine, 1997, p. 18). That is, "non-equilibrium, positive feedback loops, transition phenomena, and evolution" characterize non-linear complex behavior among sea and air temperatures, atmospheric circulation and clouds, ocean currents exchanging heat, periodic glaciations, sea level rise and fall, precipitation, moist and desert zones, and influx of solar energy (Nicolis & Prigogine, 1989, pp. 36–40, 226–228). Pressing beyond the physical–chemical realms of energy dissipation and the self-organization of geology and geomorphology scientists have developed "a theory of co-evolutionary assembly" to describe processes that have "yield [ed] a self-organized critical biosphere // over the past 650 million years" (Kauffman, 2000, pp. 21, 188–194).

The spectacular organism ← → environment co-constitution that originally changed the course of life on earth through the dramatic circulation between the micro- and the macro-spheres and that continues to self-reorganize is of major concern today since the health and well-being of all life occurs within the contexts of regional and planetary pollution and weather patterns writ large as climate (Schneider & Sagan, 2005, pp. 183–186, 198). One of our greatest challenges is to comprehensively combine analysis of the dynamic complexity of atmospheric, hydrospheric, and lithospheric phenomena with the distinctive features of living processes. The task is to accomplish a cooperative mode of better approaching the "total environment" (Juarrero, 2002, p. 110).

Conclusion

The point of using the arc of life and corresponding multiple modes of understanding as the framework for future work, rather than an anatomy only about theories of well-being or health, is that the latter, however important, must be seen in the context of the entire existential lifeworld. It is precisely this relationship of human and micro- and macro-environmental life that is too often taken for granted or over-simplified. The dimensions of life, their character and symbioses/tensions, provide a non-arbitrary basis for proceeding with individual facets and attempts to integrate large spheres of the subject matter.

Qualitative differences have phenomenally operated in the universe from the beginning as living beings emerged and became increasingly distinct

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from each other. Our understanding and action always have depended upon adequate qualitative modes of discernment, interpretation, and response (since only the prior identification of qualitative differences yields the "distinct" features that we intend to measure and compare in quantitative terms or in terms of causal relationships). Congruently, any future goals we develop in social policy/management and health-care practices, in fact even scientific knowledge, depend on and are subsumed in the practical qualitative judgments made ethically and politically in regard to parameters, priorities, and resource allocation that drive both empirical research programs and the productive/consumptive actions within our health-care systems.

Implications for an agenda for qualitative studies on health and well-being

We do need to treat individuals (whole organisms), especially in the case of human persons; but we see the limited value of exclusionary attention. In working out the arc of life we find:

- The health of any dimension is interconnected with so many other dimensions that it makes little sense to think of the health of any one "thing," neither cell nor organ, nor even organisms, since health is a function of life both in and as communities. Since humans emerge from and co-constitute both their sub- and supra-contexts, we need to approach health as a matter of not only being in ecosystems, but as ecosystems (Margulis & Sagan, 2002, p. 19).
- Specifically, in the case of persons, disclosures of value, health, and well-being in historical, social lifeworlds, are
  - a matter of the individual's lived capacity, which concretely provides the norm of pathology (Canguilhem, 2008; Goldstein, 2000);
  - inseparable from bio-cultural regions or ecologies within which we live; and
  - finally cultural events, since persons only fully reach their potential as being together with others (Maturana & Varela, 1998; Plessner, 1980).
- The provision of and access to services falls across a continuum, with well-being at the pole of high-positive satisfaction, while the other, low-negative pole is the condition of poverty (Millennium Ecosystem Assessment, 2003). Hence, poverty enters the picture as the deprivation of well-being, opening issues of justice at the heart of provision of services (Lewontin & Levins, 2007).

Thus, with a new appreciation of the contingency, particularity, and complex co-constitution operative in our individual and social lives, in the unfolding of all forms of life itself, in the correlation between ecological and human health and well-being we need to complement the quantitative with qualitative at every juncture. The intention of this essay is to take a next step by providing a framework that is not "news," but whose delineation might provide a common ground for future collaborative work.

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